

**PATENT APPLICATION**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re the Application of

Hideki HARAMOTO et al.

Attn: PCT Branch

Application No. New U.S. National Stage of PCT/JP03/04634

Filed: October 22, 2004

Docket No.: 121571

For: TRAVEL MOTION CONTROL APPARATUS FOR HYDRAULICALLY  
DRIVEN VEHICLE, HYDRAULICALLY DRIVEN VEHICLE AND WHEEL  
HYDRAULIC EXCAVATOR

**TRANSLATION OF THE ANNEXES TO THE  
INTERNATIONAL PRELIMINARY EXAMINATION REPORT**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Attached hereto is a translation of the annexes to the International Preliminary Examination Report (Form PCT/IPEA/409). The attached translated material replaces the material in the specification at pages 4-6 and the claims.

Respectfully submitted,



James A. Oliff  
Registration No. 27,075

Thomas J. Pardini  
Registration No. 30,411

JAO:TJP/emt

Date: October 22, 2004

OLIFF & BERRIDGE, PLC  
P.O. Box 19928  
Alexandria, Virginia 22320  
Telephone: (703) 836-6400

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Translation

PATENT COOPERATION TREATY

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PCT

10/512146

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference H02040P	<b>FOR FURTHER ACTION</b> See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/JP2003/004634	International filing date (day/month/year) 11 April 2003 (11.04.2003)	Priority date (day/month/year) 26 April 2002 (26.04.2002)
International Patent Classification (IPC) or national classification and IPC F16H 61/42, 61/40		
Applicant HITACHI CONSTRUCTION MACHINERY CO., LTD.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of <u>4</u> sheets, including this cover sheet.  <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of <u>6</u> sheets.
3. This report contains indications relating to the following items:  I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

Date of submission of the demand 26 November 2003 (26.11.2003)	Date of completion of this report 02 June 2004 (02.06.2004)
Name and mailing address of the IPEA/JP  Facsimile No.	Authorized officer  Telephone No.

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/JP2003/004634

## I. Basis of the report

### 1. With regard to the elements of the international application:\*

- ☐ the international application as originally filed
- ☒ the description:  
 pages 1,3-16, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages 2,2/1, filed with the letter of 09 February 2004 (09.02.2004)
- ☒ the claims:  
 pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, as amended (together with any statement under Article 19  
 pages \_\_\_\_\_, filed with the demand  
 pages 1-11, filed with the letter of 09 February 2004 (09.02.2004)
- ☒ the drawings:  
 pages 1-14, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_
- ☐ the sequence listing part of the description:  
 pages \_\_\_\_\_, as originally filed  
 pages \_\_\_\_\_, filed with the demand  
 pages \_\_\_\_\_, filed with the letter of \_\_\_\_\_

### 2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language \_\_\_\_\_ which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

### 3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

### 4. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages \_\_\_\_\_
- ☐ the claims, Nos. \_\_\_\_\_
- ☐ the drawings, sheets/fig \_\_\_\_\_

### 5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\*

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rule 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International Application No.

PCT/JP03/04634

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims	1-11	YES
	Claims		NO
Inventive step (IS)	Claims		YES
	Claims	1-11	NO
Industrial applicability (IA)	Claims	1-11	YES
	Claims		NO

**2. Citations and explanations****List of documents cited in the ISR****Document 1**

JP, 2001-304409, A (Komatsu Ltd.), October 31, 2001 (10.31.01), claims, (Family: none)

**Document 2**

JP, 2000-074213, A (Shin Caterpillar Mitsubishi Ltd.), March 14, 2000 (03.14.00), claims, (Family: none)

**Document 3:**

JP, 1-116371, A (Mitsubishi Heavy Industries Ltd., MHI Sagami Hai Tec K.K.), May 9, 1989 (05.09.89), page 2 upper right column lines 5-11, (Family: none)

**Document 4**

JP, 6-193730, A (Hitachi Construction Machinery Co., Ltd.), July 15, 1994 (07.15.94), paragraph [0050], Fig. 5, (Family: none)

(1) The inventions described in claims 1-5, 7, 10 and 11 do not appear to involve an inventive step based on document 1 or 2 cited in the ISR. Documents 1 and 2 describe art for decelerating a traveling motor by increasing capacity of the traveling motor when a rotational speed of the traveling motor faster at or above a prescribed value is detected, in order to prevent over-speed of the traveling motor. The prescribed value of said rotational speed and degree of increase in motor capacity can be determined as appropriate by a person skilled in the art. Further, it would be easy for a party skilled in the art to conceive of restoring normal control when the motor speed that had exceeded a prescribed value falls below the prescribed value due to such motor capacity control.

(2) The invention described in claim 6 does not appear to involve an inventive step based on documents 1, 2 and 3 cited in the ISR. Document 3 describes art for gradually controlling traveling motor capacity. Adopting the art described in document 3 to the traveling motor control described in document 1 or 2 to conceive of the invention described in claim 6 would be easy for a person skilled in the art.

(3) The invention described in claim 8 does not appear to involve an inventive step based on documents 1, 2 and 4 cited in the ISR. Document 4 discloses the technical idea of increasing control force by increasing relief pressure of hydraulic oil from the traveling motor in accordance with traveling speed, i.e., with traveling motor rotational speed. It would be easy for a person skilled in the art to conceive of the invention described in claim 8 by applying the technical idea described in document 4 to the deceleration control of the traveling motor described in document 1 or 2.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International Application No.

PCT/JP03/04634

**Supplemental Box**

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of Box V:

(4) The invention described in claim 9 does not appear to involve an inventive step based on documents 1, 2, 3 and 4 cited in the ISR. Generally, performing gradual control in order to prevent shock is a common art, as can be seen from the descriptions in document 3. Applying the common art described in document 3 and the art described in document 4 to control of the traveling motor as described document 1 or 2 and thus conceiving of the invention described in claim 9 would be easy for a person skilled in the art.

DT01 Rec'd PCT/PT 22 OCT 2004

ART 34 AMDT

Amendments under PCT Article 34:

Page 2 and 2/1 of the Description

5 A travel motion control apparatus for a hydraulically driven vehicle, according to the present invention, comprises: a hydraulic pump that is driven by a driving motor; a travel motion motor that is driven with pressure oil supplied from the hydraulic pump; a travel motion control  
10 valve that controls a flow rate of the pressure oil supplied from the hydraulic pump to the travel motion motor; a means for operation with which the travel motion control valve is operated; a means for rotation rate detection that detects a rotation rate of the travel motion motor; and a means for  
15 motor over rotation prevention that increases a displacement volume in the travel motion motor to a level equal to a predetermined value smaller than a maximum displacement volume if the means for rotation rate detection detects a rotation rate equal to or higher than a predetermined  
20 rotation rate upper limit which is equal to or less than an allowable rotation rate limit of the travel motion motor.

By adopting the structure described above, the rotation rate of the travel motion motor is reduced when the rotation rate of the travel motion motor is equal to or

greater than the rotation rate upper limit and, as a result,  
over rotation of the travel motion motor is prevented.

Also, a travel motion control apparatus for a  
hydraulically driven vehicle, according to the present  
5 invention, comprises: a hydraulic pump that is driven by a  
driving motor; a travel motion motor that is driven with  
pressure oil supplied from the hydraulic pump; a means for  
motor displacement volume control that controls a  
displacement volume of the travel motion motor in  
10 correspondence to a travel pressure at the travel motion  
motor; a travel motion control valve that controls a flow rate  
of the pressure oil supplied from the hydraulic pump to the  
travel motion motor; a means for operation with which the  
travel motion control valve is operated; a means for rotation  
15 rate detection that detects a rotation rate of the travel  
motion motor; and a means for motor over rotation prevention  
that increases the displacement volume of the travel motion  
motor regardless of motor displacement volume control  
executed by the means for motor displacement volume control  
20 if the means for rotation rate detection detects a rotation  
rate equal to or higher than a predetermined rotation rate  
upper limit. The means for motor over rotation prevention  
stops control for increasing the displacement volume of the  
travel motion motor once the rotation rate of the travel  
25 motion motor becomes equal to or less than a predetermined

rotation rate lower limit which is at least lower than the rotation rate upper limit, and the displacement volume of the travel motion motor is controlled by the means for motor displacement volume control in correspondence to the  
5 traveling pressure.

Moreover, a travel motion control apparatus for a hydraulically driven vehicle, according to the present invention, comprises: a hydraulic pump that is driven by a driving motor and outputs hydraulic operating oil inside a  
10 tank; a travel motion motor that is driven with pressure oil supplied from the hydraulic pump; a travel motion control valve that controls a flow rate of the pressure oil supplied from the hydraulic pump to the travel motion motor and includes a pressure oil supply port through which the  
15 pressure oil is supplied to the travel motion motor and a return port through which the pressure oil returns to the tank; a counterbalance valve disposed between the travel motion motor and the travel motion control valve, which is controlled by a travel pressure output from the hydraulic  
20 pump; a means for operation with which the travel motion control valve is operated; a means for rotation rate detection that detects a rotation rate of the travel motion motor; and a means for motor over rotation prevention that reduces a rotation rate of the travel motion motor if the means



ART 34 AMDT

for rotation rate detection detects a rotation rate equal to or higher than a predetermined rotation rate upper limit.

It is preferred that the travel motion motor is a variable displacement travel motion motor, and a  
5 displacement volume of the travel motion motor is increased to a predetermined value smaller than a maximum displacement volume if a rotation rate equal to or higher than the rotation rate upper limit is detected.

There may be provided a means for motor displacement  
10 volume control that controls the displacement volume of the motor in correspondence to the travel pressure at the travel motion motor; the displacement volume of the travel motion motor may be increased if a rotation rate equal to or higher than the rotation rate upper limit is detected; control for  
15 increasing the displacement volume of the travel motion motor may be stopped once the rotation rate of the travel motion motor becomes equal to or less than a predetermined rotation rate lower limit which is at least lower than the rotation rate upper limit, and the displacement volume of the travel  
20 motion motor may be controlled in correspondence to the traveling pressure.

It is preferred that the displacement volume of the travel motion motor is gradually increased, and the displacement volume of the travel motion motor is increased  
25 so that the displacement volume of the travel motion motor

becomes 40% to 70% of a maximum displacement volume of the travel motion motor.

There may be provided a variable relief valve that allows a relief pressure of the pressure oil from the travel motion motor to be altered; and the relief pressure at the variable relief valve may be increased by a means for motor over rotation prevention. In this case, it is preferred that the relief pressure at the variable relief valve is gradually increased.

10 The travel motion control apparatus described above achieves particularly notable advantages when installed in a hydraulically driven vehicle and especially in a wheel hydraulic excavator.

15 BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is an external view of a wheel excavator in which the present invention is adopted;

FIG. 2 is a circuit diagram of the travel motion hydraulic circuit in the hydraulically driven vehicle  
20 achieved in a first embodiment of the present invention;

FIG. 3 presents a flowchart of the processing executed by the controller constituting the travel motion control apparatus in the first embodiment of the present invention;

10/512146  
DT01 Rec'd PCT/PTC 22 OCT 2004

CLAIMS

1. (amended)

A travel motion control apparatus for a hydraulically driven vehicle, comprising:

5 a hydraulic pump that is driven by a driving motor;  
a travel motion motor that is driven with pressure oil supplied from the hydraulic pump;

a travel motion control valve that controls a flow rate of the pressure oil supplied from the hydraulic pump to the  
10 travel motion motor;

a means for operation with which the travel motion control valve is operated;

a means for rotation rate detection that detects a rotation rate of the travel motion motor; and

15 a means for motor over rotation prevention that increases a displacement volume in the travel motion motor to a level equal to a predetermined value smaller than a maximum displacement volume if the means for rotation rate detection detects a rotation rate equal to or higher than a  
20 predetermined rotation rate upper limit which is equal to or less than an allowable rotation rate limit of the travel motion motor.

2. (amended)

A travel motion control apparatus for a hydraulically  
25 driven vehicle, comprising:

a hydraulic pump that is driven by a driving motor;  
a travel motion motor that is driven with pressure oil  
supplied from the hydraulic pump;

a means for motor displacement volume control that  
5 controls a displacement volume of the travel motion motor in  
correspondence to a travel pressure at the travel motion  
motor;

a travel motion control valve that controls a flow rate  
of the pressure oil supplied from the hydraulic pump to the  
10 travel motion motor;

a means for operation with which the travel motion  
control valve is operated;

a means for rotation rate detection that detects a  
rotation rate of the travel motion motor; and

15 a means for motor over rotation prevention that  
increases the displacement volume of the travel motion motor  
regardless of motor displacement volume control executed by  
the means for motor displacement volume control if the means  
for rotation rate detection detects a rotation rate equal to  
20 or higher than a predetermined rotation rate upper limit,  
wherein:

the means for motor over rotation prevention stops  
control for increasing the displacement volume of the travel  
motion motor once the rotation rate of the travel motion motor  
25 becomes equal to or less than a predetermined rotation rate

lower limit which is at least lower than the rotation rate upper limit, and the displacement volume of the travel motion motor is controlled by the means for motor displacement volume control in correspondence to the traveling pressure.

5 3. (amended)

A travel motion control apparatus for a hydraulically driven vehicle, comprising:

a hydraulic pump that is driven by a driving motor and outputs hydraulic operating oil inside a tank;

10 a travel motion motor that is driven with pressure oil supplied from the hydraulic pump;

a travel motion control valve that controls a flow rate of the pressure oil supplied from the hydraulic pump to the travel motion motor and includes a pressure oil supply port  
15 through which the pressure oil is supplied to the travel motion motor and a return port through which the pressure oil returns to the tank;

a counterbalance valve disposed between the travel motion motor and the travel motion control valve, which is  
20 controlled by a travel pressure output from the hydraulic pump;

a means for operation with which the travel motion control valve is operated;

a means for rotation rate detection that detects a  
25 rotation rate of the travel motion motor; and

a means for motor over rotation prevention that reduces a rotation rate of the travel motion motor if the means for rotation rate detection detects a rotation rate equal to or higher than a predetermined rotation rate upper limit.

5 4. (amended)

A travel motion control apparatus for a hydraulically driven vehicle according to claim 3, wherein:

the travel motion motor is a variable displacement travel motion motor;

10 the rotation rate upper limit assumes a value equal to or smaller than an allowable rotation rate limit of the travel motion motor; and

the means for motor over rotation prevention increases a displacement volume of the travel motion motor to a  
15 predetermined value smaller than a maximum displacement volume if the means for rotation rate detection detects a rotation rate equal to or higher than the rotation rate upper limit.

5. (amended)

20 A travel motion control apparatus for a hydraulically driven vehicle according to claim 3, wherein:

the travel motion motor is a variable displacement travel motion motor;

there is provided a means for motor displacement volume  
25 control that controls the displacement volume of the motor

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in correspondence to the travel pressure at the travel motion motor;

the means for motor over rotation prevention increases the displacement volume of the travel motion motor regardless of motor displacement volume control executed by the means  
5 for motor displacement volume control if the means for rotation rate detection detects a rotation rate equal to or higher than the rotation rate upper limit; and

control for increasing the displacement volume of the travel motion motor is stopped once the rotation rate of the  
10 travel motion motor becomes equal to or less than a predetermined rotation rate lower limit which is at least lower than the rotation rate upper limit and the displacement volume of the travel motion motor is controlled by the means  
15 for motor displacement volume control in correspondence to the traveling pressure.

6. (amended)

A travel motion control apparatus for a hydraulically driven vehicle according to any of claims 1, 2, 4 and 5,  
20 wherein:

if the means for rotation rate detection detects a rotation rate equal to or higher than the rotation rate upper limit, the means for motor over rotation prevention gradually increases the displacement volume of the travel motion motor.

25 7. (amended)

ART 34/Amend

A travel motion control apparatus for a hydraulically driven vehicle according to any of claims 1, 2, 4, 5 and 6, wherein:

the means for motor over rotation prevention increases  
5 the displacement volume of the travel motion motor so that the displacement volume of the travel motion motor becomes 40% to 70% of a maximum displacement volume of the travel motion motor.

8. (amended)

10 A travel motion control apparatus for a hydraulically driven vehicle, comprising:

a hydraulic pump that is driven by a driving motor;

a travel motion motor that is driven with pressure oil supplied from the hydraulic pump;

15 a travel motion control valve that controls a flow rate of the pressure oil supplied from the hydraulic pump to the travel motion motor;

a means for operation with which the travel motion control valve is operated;

20 a means for rotation rate detection that detects a rotation rate of the travel motion motor;

a variable relief valve that allows a relief pressure of the pressure oil from the travel motion motor to be altered; and



a means for motor over rotation prevention that increases the relief pressure at the variable relief valve if the means for rotation rate detection detects a rotation rate equal to or higher than a predetermined rotation rate upper limit which is equal to or less than an allowable rotation rate limit of the travel motion motor.

9. (amended)

A travel motion control apparatus for a hydraulically driven vehicle according to claim 8, wherein:

10 if the means for rotation rate detection detects a rotation rate equal to or higher than the rotation rate upper limit, the means for motor over rotation prevention gradually increases the relief pressure at the variable relief valve.

10. (amended)

15 A hydraulically driven vehicle comprising a travel motion control apparatus according to any of claims 1 through 9.

11. (new)

A wheel hydraulic excavator comprising a travel motion control apparatus according to any of claims 1 through 9.